DOCUMENT RESUME

ED 086 725 TM 003 376

AUTHOR	Brouillet, Frank B.
TITLE	Phase IV: Educational Needs Assessment For Washington State Students. March 1973. (Summary).
INSTITUTION	CTB/McGraw Hill, Monterey, Calif.
SPONS AGENCY	Washington Office of the State Superintendent of Public Instruction, Olympia.
PUB DATE	Mar 73
NOTE	42p.
AVAILABLE FROM	Dr. Frank B. Brouillet, Superintendent of Public Instruction, Olympia, WA 98504
EDRS PRICE-	MF-$0.65 HC-$3.29
DESCRIPTORS	Academic Achievement; *Educational Assessment; *Elementary Grades; Grade 4; Grade 6; *Mathematics; Parochial Schools; Private Schools; Public Schools; *Reading Achievement; Scores; *State Surveys
IDENTIFIERS	*Washington State Educational Assessment Program

ABSTRACT

The results of the Washington Elementary Educational Assessment Project (WEEAP) are presented in this report. The purposes of the Assessment project were (1) to assess the reading and mathematics achievement in Washington elementary schools by sampling fourth and sixth grade students in randomly selected school buildings; (2) to identify instructional objectives and to determine the degree to which students are achieving those objectives; and (3) to determine the degree to which students are achieving the level expected of them. Three instruments were administered concurrently; the California Achievement Tests, 1970; the Short Form Test of Academic Aptitude; and a fact sheet describing school characteristics, completed by school personnel. Six main conclusions were drawn from the results of the assessment, including the fact that the students generally scored as anticipated in reading and significantly below expectation in mathematics. (Author)

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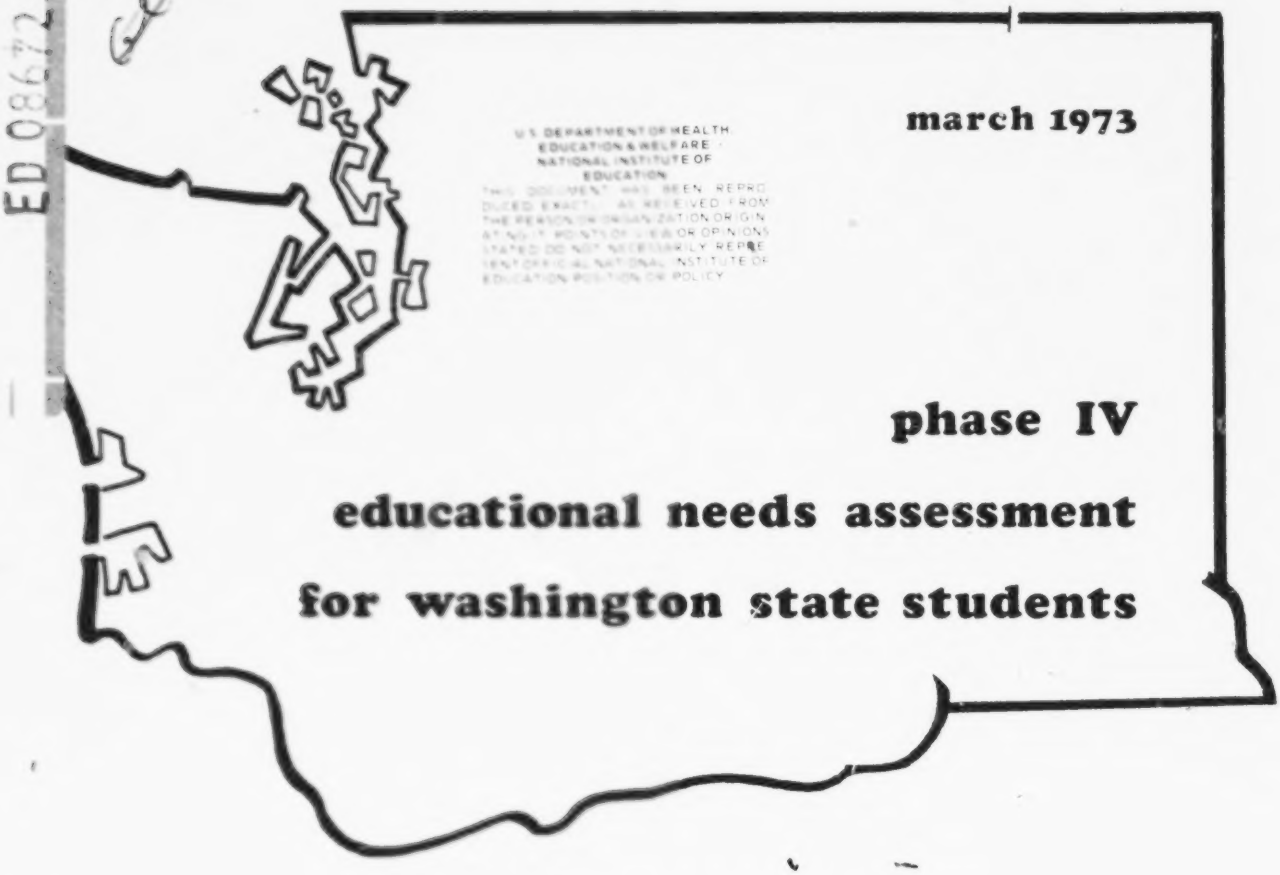

march 1973

phase IV
educational needs assessment
for washington state students

summary

dr. frank b. brouillet, superintendent of public instruction
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ED 086725

TM 003 326

PHASE IV:

EDUCATIONAL NEEDS ASSESSMENT FOR WASHINGTON STATE STUDENTS

MARCH, 1973

Prepared for

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Washington State Superintendent of Public Instruction
(Grants Management Section)

and

Washington State Title III (ESEA) Advisory Council

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INTRODUCTION

This report presents the results of the Washington Elementary Education Assessment Project (financed by Title III of the Elementary and Secondary Education Act) and prepared for the Washington Superintendent of Public Instruction by the Department of Programs and Services, CTB/McGraw-Hill during school year 1971-72.

The purposes of the project were: 1) to assess the reading and mathematics achievement in Washington elementary schools by sampling fourth and sixth grade students in randomly selected school buildings, 2) to identify instructional objectives measured by the testing instrument and to determine the degree to which students are achieving those objectives; and 3) to determine the degree to which students are achieving at or near a level expected of them.

It should be noted that even though private schools were selected randomly, the student data produced in that group cannot be meaningfully compared to student data from other groups. No attempt was made to control for the fact that students attending private schools may be a unique group. Unaccounted variables which may or may not have produced the higher achievement scores in the private/parochial group include parent interest in the students' education (as evidenced by placement in private school) and mean intelligence level (reported in this document).

DESIGN OF THE STUDY

INSTRUMENTS

Three instruments were administered concurrently to acquire the data needed for this assessment: (1) *California Achievement Tests, 1970 Edition* (CAT-70), (2) *Short Form Test of Academic Aptitude* (SFTAA), and (3) a fact sheet describing various school characteristics which was completed by school personnel.

SAMPLE

The design of the study stipulated that at least 10 percent of the fourth and sixth graders in at least 8 percent of the Washington elementary schools were to be selected as the sample for this study. Table 1 indicates the numbers of students in both grades and the number of schools sampled in the state. Schools were selected randomly within two parameters:

1. District Type.
    a. Urban Metropolitan -- Seattle, Tacoma and Spokane.
    b. Urban Non-metropolitan -- urban areas of over 15,000 population which are not contiguous with any urban or suburban areas.
    c. Suburban -- school districts contiguous with an urban area and primarily residential.
    d. Rural -- school districts with less than 15,000 population and not contiguous with any urban or suburban area.
    e. Private/Parochial -- accredited schools within the state but independent of the public school system.
2. Relative Size of District Within Each District Type.
    a. Large.
    b. Medium.
    c. Small.

Table 1

OVERALL NUMBER OF SCHOOLS AND RESPECTIVE NUMBERS OF STUDENTS IN SAMPLE

DISTRICT TYPE	NUMBER OF SCHOOLS	GRADE 4 STUDENTS	GRADE 6 STUDENTS
Urban Metro	17	1,113	1,075
Urban Non-metro	16	1,011	987
Suburban	39	2,738	2,562
Rural	36	1,437	1,761
Private/Parochial	19	464	496
Total State	127	6,763	6,881

PROCEDURES

The Washington Elementary Education Assessment project was announced to Washington educators and the public by the Washington State Office of Superintendent of Public Instruction. One person in each district was designated to handle all aspects of the assessment program for the schools in that district. Pre-testing workshops, covering in detail all aspects of the program, were conducted for local personnel by a CTB/McGraw-Hill Consultant prior to the testing which occurred in October, 1971. Testing was handled by the local district and results were sent to CTB/McGraw-Hill in Monterey, California, for scoring, analysis, and report writing.

ANALYSES

Data from the testing were analyzed to give a comprehensive assessment of the status of elementary education in Washington in Reading and Mathematics. The data were analyzed in the following ways:

1. The achievement of Washington fourth and sixth graders, as measured by the CAT-70, was compared to the national norms for this test.

2. The average achievement score of these Washington students, as measured by the CAT-70, was compared to their average anticipated achievement score.

   Each student's anticipated achievement level was predicted from scores on the SFTAA as well as from other factors (grade, age, sex) and was reported in Anticipated Achievement Grade Equivalent (AAGE) units. These were averaged for the state sample.

3. The distribution of students scoring significantly above and below their anticipated achievement was compared to the distribution of students in the norm group who scored above and below their expected level of performance.

   A low ability student who may be far behind, relative to the norm, can be scoring above his own anticipated achievement. Likewise, a high ability child can score well above the norm but still under that level which is expected of him.

   If the Washington distribution were like that of the norm group, 10 percent would score significantly above the anticipated achievement and 10 percent would score significantly below. This pattern of scores is called the "10-10 Distribution."

   If favorable comparison with the norm group were the criterion for success, positive trends would be reflected in a Washington distribution with more than 10 percent scoring above and/or less than 10 percent scoring below their anticipated achievement. On the other hand, negative trends would result if less than 10 percent scored above and/or more than 10 percent scored below.

4. School characteristics were analyzed to determine how they related to achievement. Fifteen school characteristics were selected from data obtained via a fact sheet completed by school personnel, and from information supplied by the office of the SPI.

CONSIDERATIONS

While the analyses reveal many facts concerning the total Washington Grade 4 and 6 populations, caution should be used to avoid making specific judgments about a particular school or district. Likewise, assumptions should not be made concerning cause-and-effect relationships. If a relationship were discovered between achievement in a subject area and a school characteristic, it would be highly inaccurate to assume that the achievement was the result of the school characteristic. Such a relationship might, however, provoke questions and provide incentive for a carefully controlled study to determine whether or not a cause-and-effect relationship did, in fact, exist.

ACHIEVEMENT COMPARISONS

Washington achievement for Reading and Mathematics as measured by CAT-70 was compared to the national norm. For each curricular area, the achievement of Washington students was also compared to their anticipated achievement, and the distribution of anticipated achievement scores in Washington was compared to the "10-10 Distribution" of the norm group. The major unit of measure used in this analysis was the "grade equivalent." For test scores, each tenth of a grade equivalent is equal to one month on the grade equivalent scale. For example, 4.7 is read as fourth grade, seventh month.

READING

The CAT-70 Reading Test is divided into two parts: Vocabulary and Comprehension. The Vocabulary section consists of 40 items which indicate the student's knowledge of the word meanings in context. A 42-item Comprehension section measures the student's understanding of what he reads. Three scores are reported: Vocabulary, Comprehension, and Total Reading.

Washington Distribution of Scores vs. Norm Distribution. Figure 1 compares the average Reading achievement of the Washington fourth grade sample to the national norm. In both Vocabulary and Comprehension, the state average was comparable to the norm.[1] In Total Reading, averages for suburban and private/parochial schools exceeded the norm, while averages for urban metro, urban non-metro and rural schools were comparable to the norm. The Vocabulary average either exceeded or was comparable to the Comprehension average in all district types except rural. Private/parochial schools' average achievement was far above the norm and the achievement of schools in the other four district types. This performance was not totally unexpected, however, as the mean intelligence quotient of this group (IQ = 105.6) was higher than the mean of the remaining part of the sample (IQ = 100.5). This was also true of Grade 6 Reading.

Reading achievement of the Washington sixth grade sample and the national norm is compared in Figure 2. The results for the Washington sample showed an average score of 6.6, five months over the norm. The average of each district type either exceeded the norm or was comparable to it. With few exceptions the district type averages of the two reading subtests were significantly above the norm.

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[1] A one month deviation from the norm is of no practical significance, and it can be said that achievement is comparable. In a sample of this size a deviation of two months or more might be considered of some practical significance.

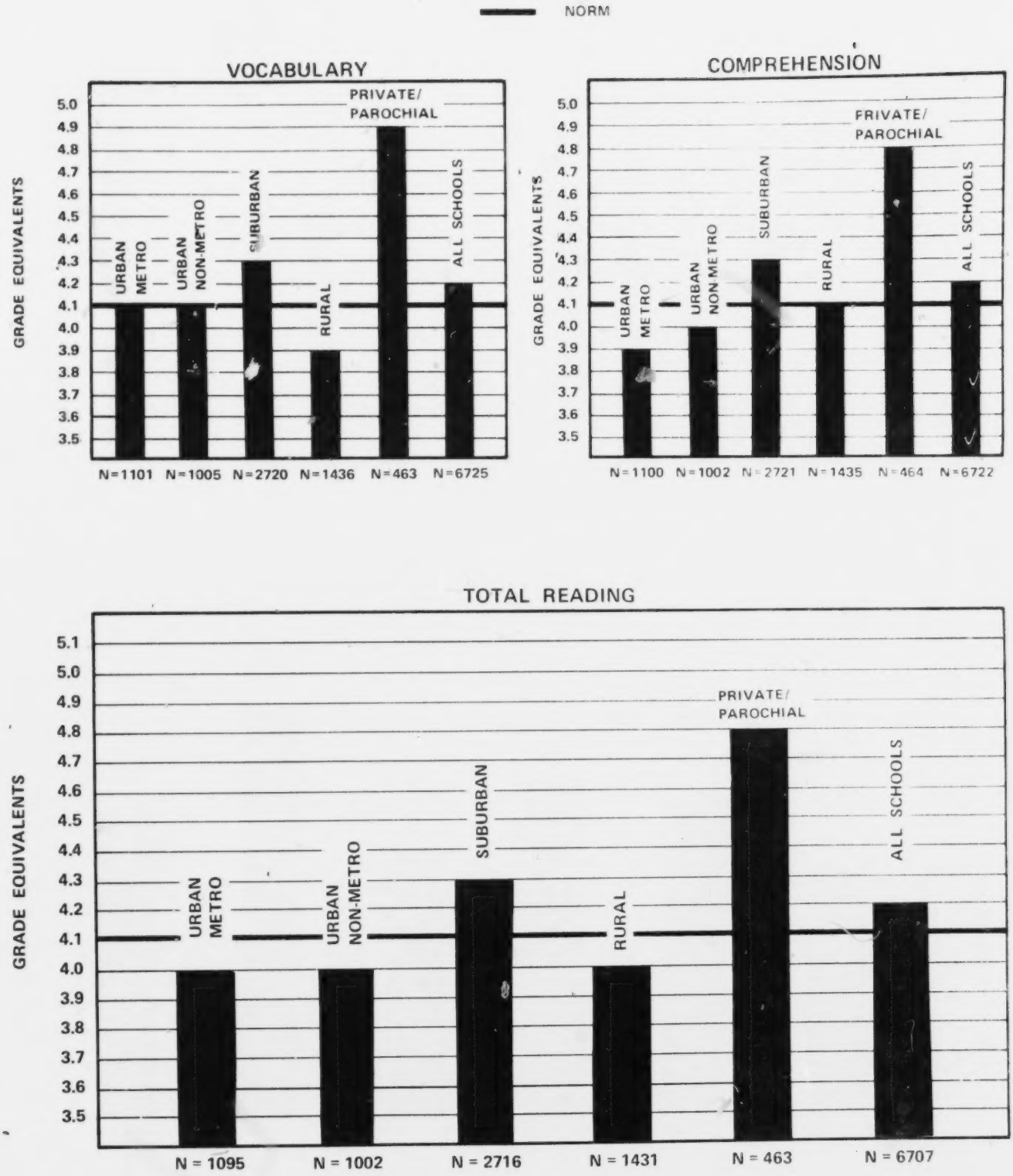


Figure 1
Grade 4 Reading

COMPARISON OF WASHINGTON ACHIEVEMENT TO NORM GROUP ACHIEVEMENT

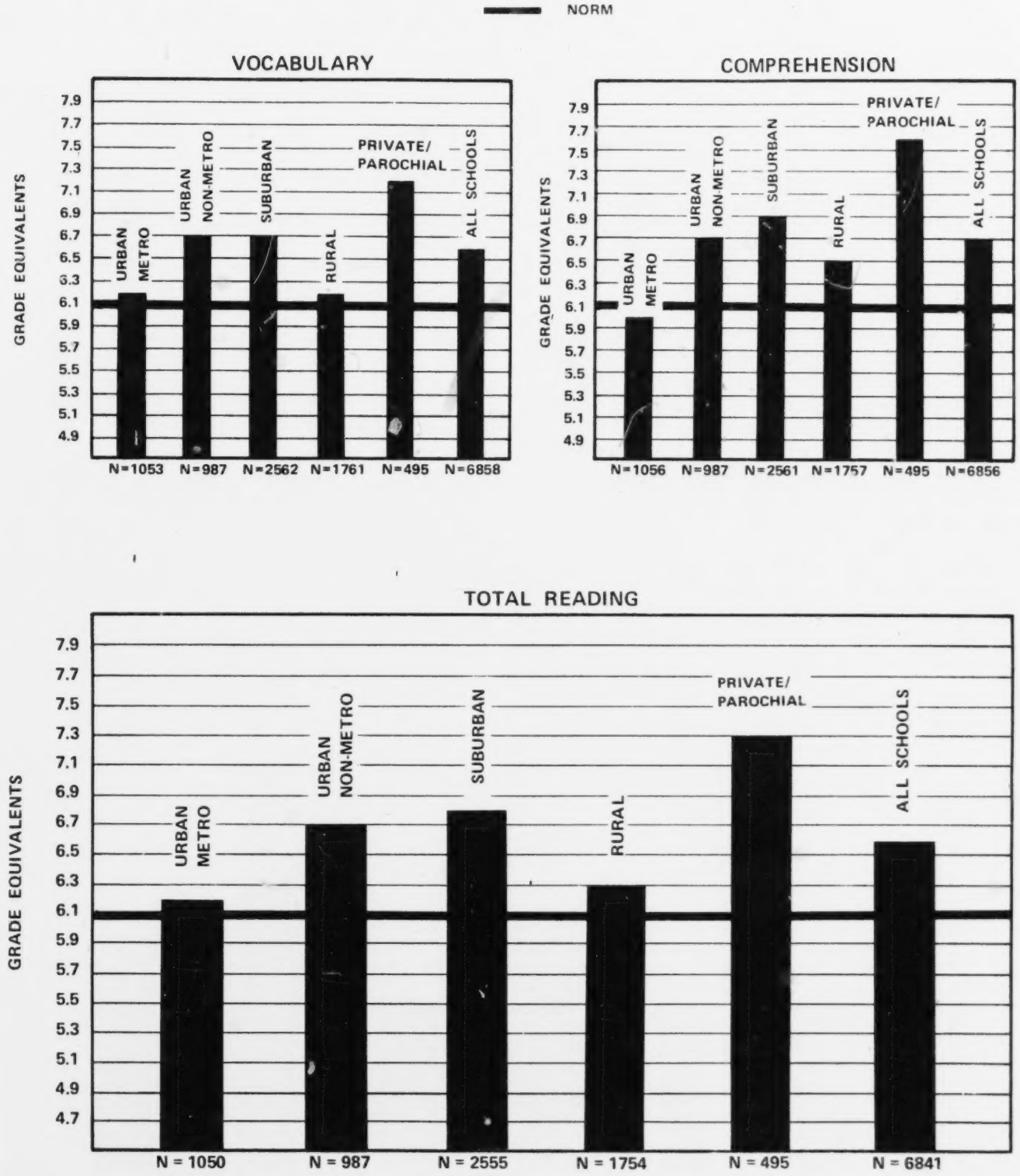


Figure 2
Grade 6 Reading

COMPARISON OF WASHINGTON ACHIEVEMENT TO NORM GROUP ACHIEVEMENT

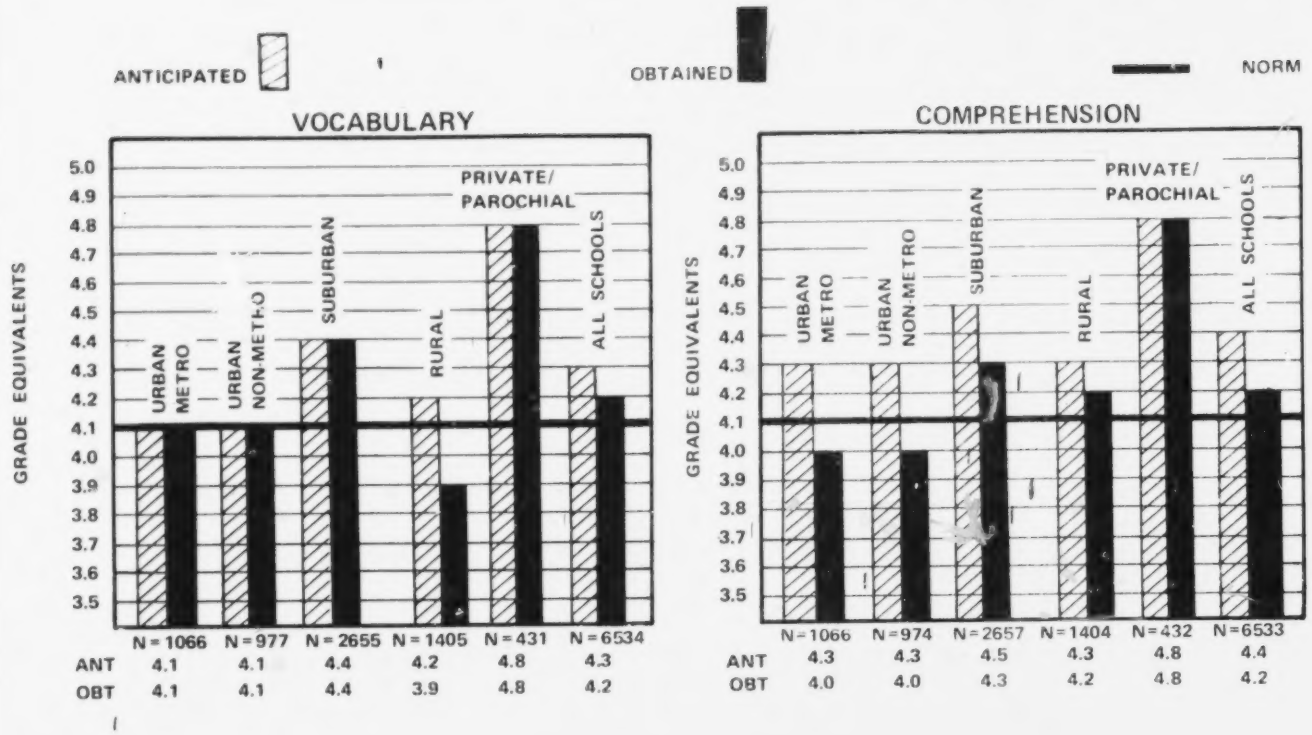
Washington Grade Equivalents vs. Expected Grade Equivalents. Figures 3 and 4 compare the average anticipated reading achievement and average obtained achievement of Grade 4 and Grade 6 of the Washington sample. (See Page 4 for an explanation of anticipated achievement.) In regard to averages, a discrepancy of one month is of no practical significance. (See urban metro grade 4, urban non-metro grade 4, suburban grade 4, rural grades 4 and 6, and total state grades 4 and 6.) Note that in Grade 4, with the exceptions of the rural schools, anticipated and obtained achievement for each district type were identical in Vocabulary while in Comprehension the anticipated achievement was generally higher than the obtained achievement. The only real differences in Grade 6 were found in higher anticipated than obtained achievement in urban metro Vocabulary and Comprehension and in urban non-metro Comprehension.

Washington Distribution of Percentages. Table 2 compares the percentages of students in the Washington sample who scored above and below anticipated achievement with the "10-10 Distribution" of the norm group. (See Page 4 for a discussion of the "10-10 Distribution.") Generally, fewer students than anticipated scored significantly above their anticipated achievement while slightly more than expected scored below.

Table 2
Grades 4 and 6 Reading

PERCENTAGES OF STUDENTS SCORING ABOVE AND BELOW THEIR ANTICIPATED ACHIEVEMENT IN TOTAL READING

DISTRICT TYPE	GRADE 4		GRADE 6	
	% ABOVE	% BELOW	% ABOVE	% BELOW
Urban Metro	6.9	11.1	6.2	13.4
Urban Non-metro	6.0	12.4	8.5	10.8
Suburban	7.4	11.1	8.4	9.1
Rural	6.0	12.0	8.8	9.3
Private/Parochial	9.0	9.6	8.9	8.2
State	6.9	11.4	8.2	10.0
Norm Group	10.0	10.0	10.0	10.0



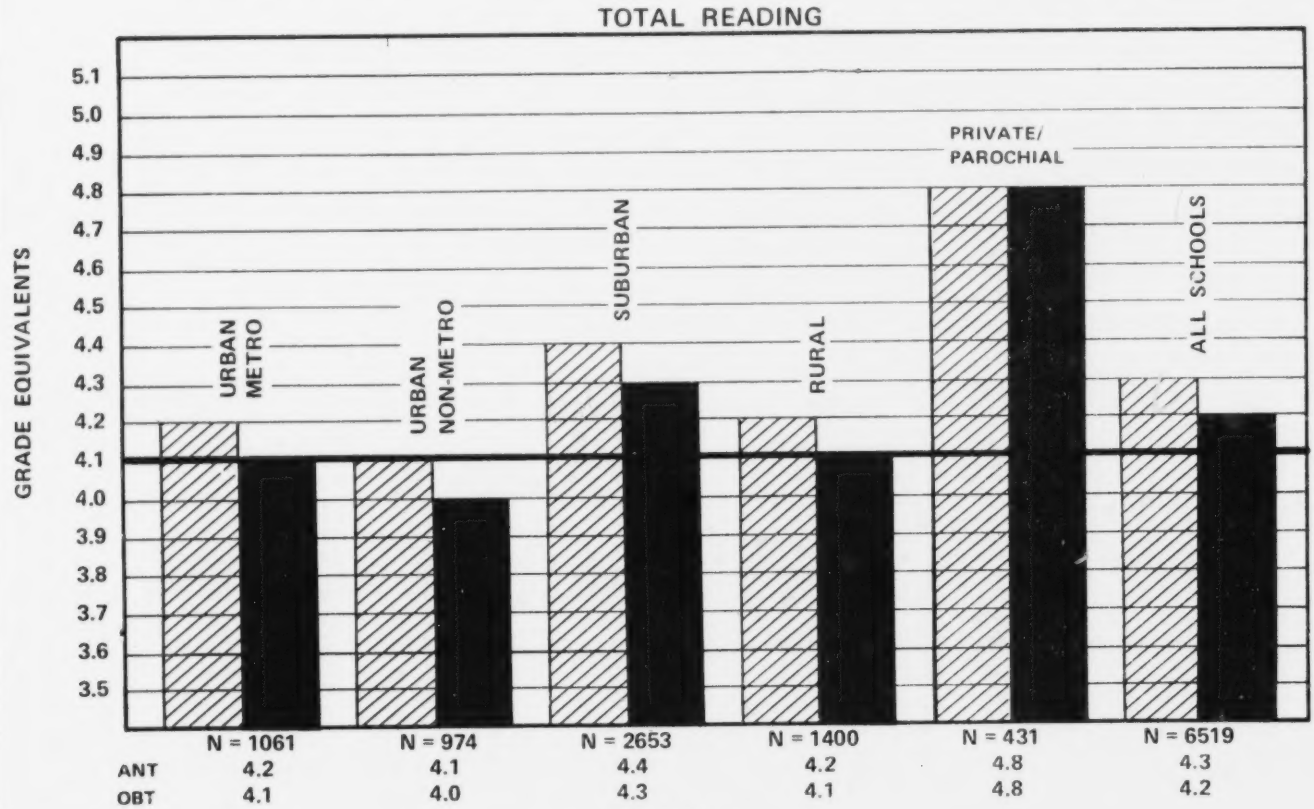
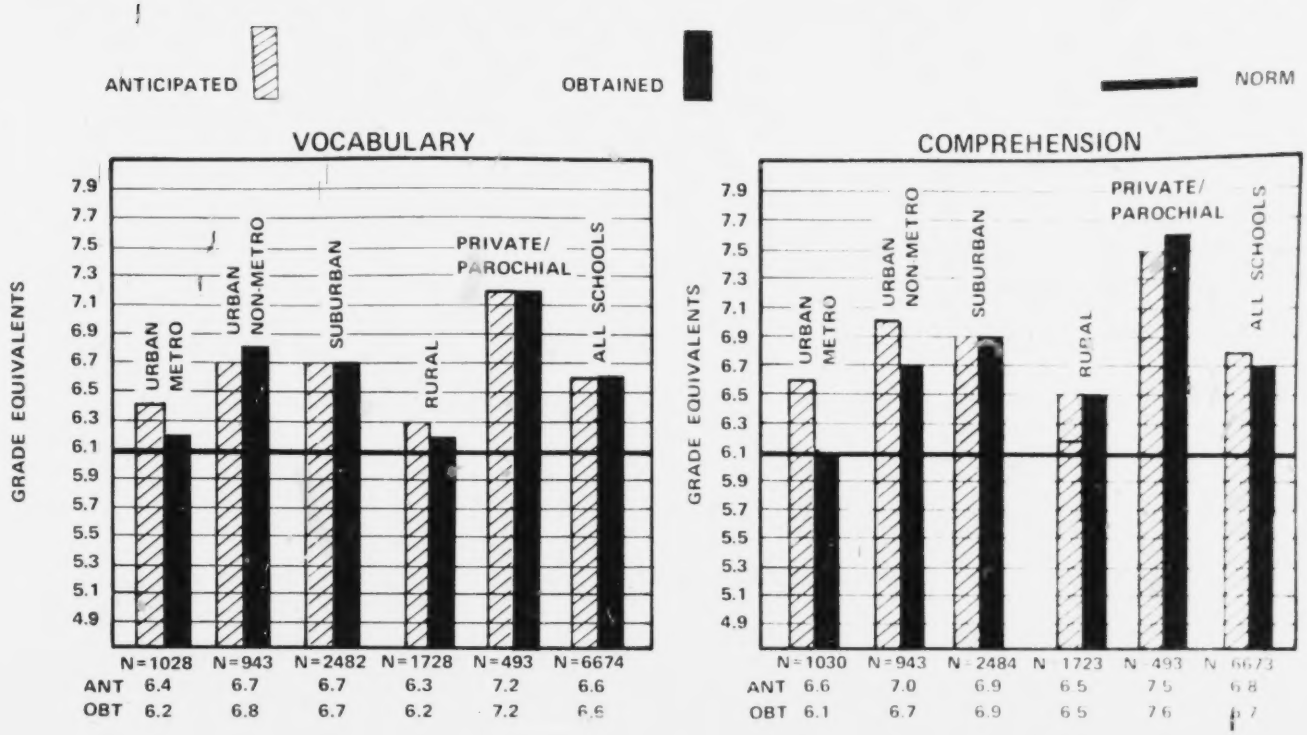


Figure 3
Grade 4 Reading

COMPARISON OF ANTICIPATED ACHIEVEMENT TO OBTAINED ACHIEVEMENT



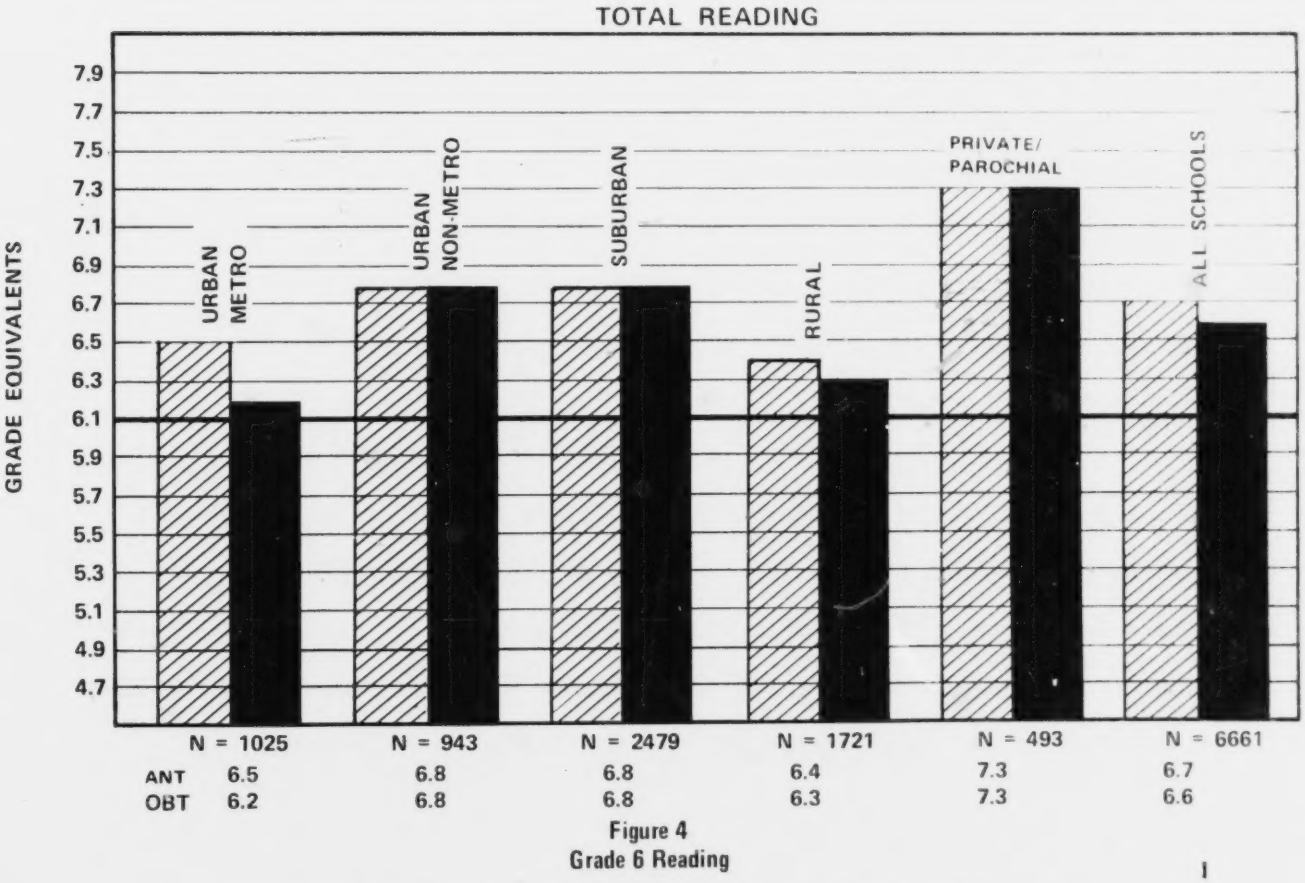


Figure 4
Grade 6 Reading

COMPARISON OF ANTICIPATED ACHIEVEMENT TO OBTAINED ACHIEVEMENT

MATHEMATICS

The CAT-70 Mathematics Test is divided into two parts: (1) Computation and (2) Concepts and Problems. The Computation subtest contains 68 items testing addition, subtraction, multiplication, and division of whole numbers and fractions. The Concepts and Problems subtest consists of 25 items measuring a student's understanding and use of mathematics concepts, plus 15 items dealing with word problems.

Washington Distribution of Scores vs. Norm Distribution. Figure 5 compares average obtained Mathematics achievement of the Washington Grade 4 sample to the national norm. It is apparent that the Total Mathematics average for the state is well below the national norm as were the averages of all district types except private/parochial. The performance of the private/parochial schools was not totally unexpected: the mean intelligence quotient of this group, IQ = 105.6, was higher than that of the remaining part of the sample, IQ = 100.5. However, the total state average for Concepts and Problems is comparable to the norm while the average for Computation is below it. Also, with the exception of private/parochial, the averages of all district types were well below norm in Computation while only two district types (urban non-metro and rural) were below norm in Concepts and Problems.

A similar pattern existed in the comparison of Grade 6 obtained achievement averages to the national norm (see Figure 6): all district types, with the exception of private/parochial, had total math averages which were below norm. The Concepts and Problems averages for all district types were comparable to or above the national norm while the Computation averages for all district types except private/parochial were below norm.

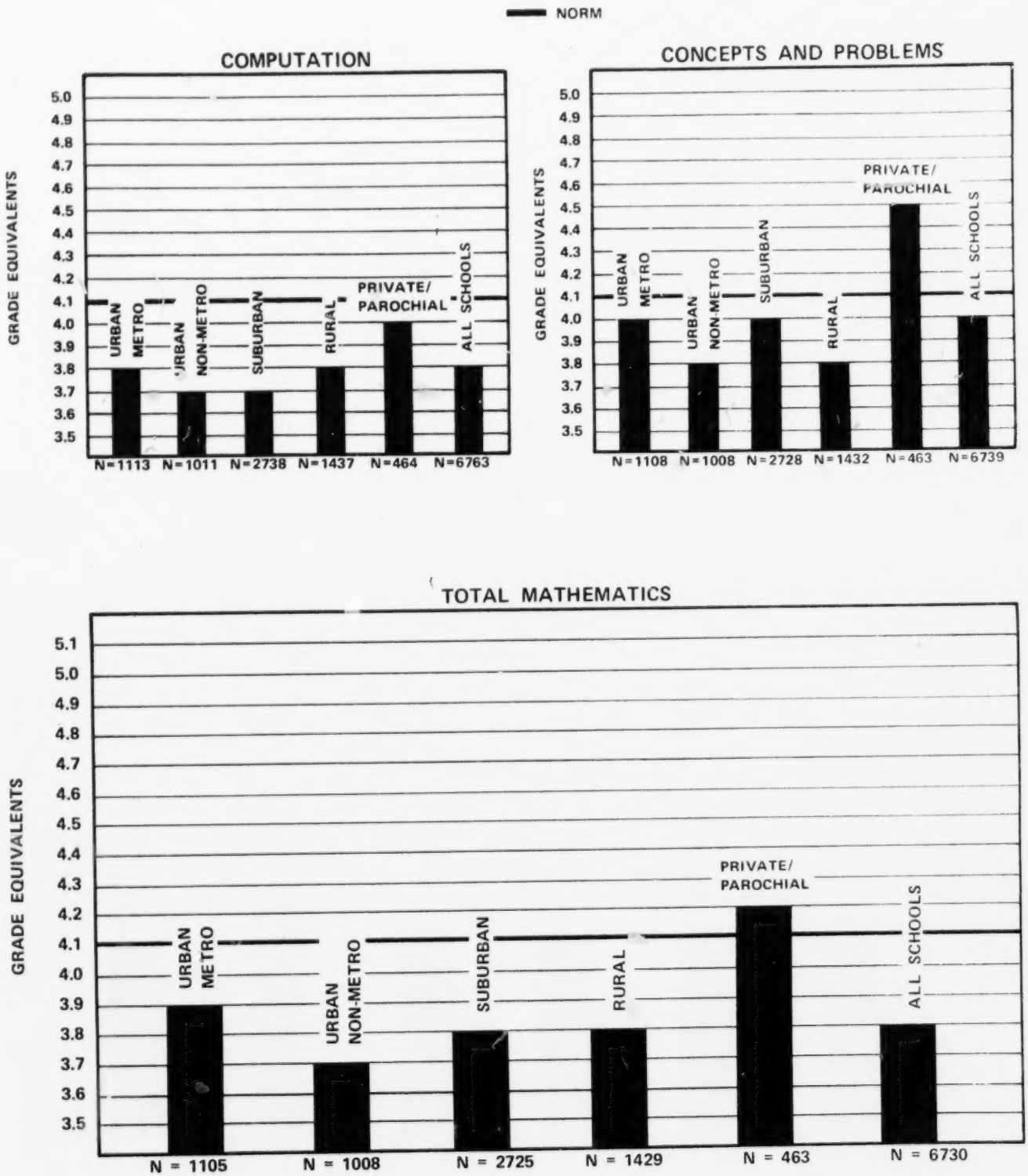


Figure 5
Grade 4 Mathematics

COMPARISON OF WASHINGTON ACHIEVEMENT TO NORM GROUP ACHIEVEMENT

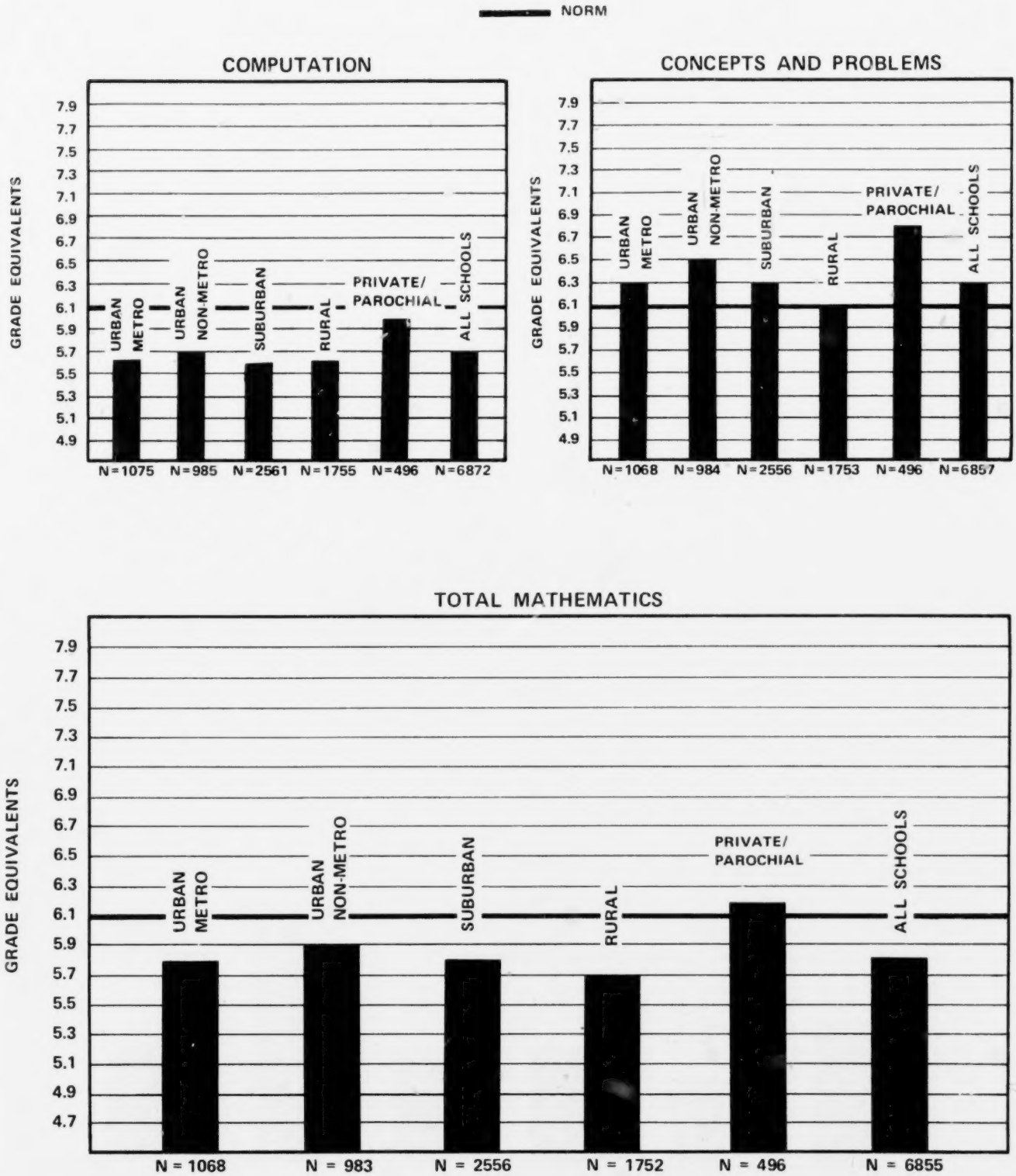


Figure 6
Grade 6 Mathematics

COMPARISON OF WASHINGTON ACHIEVEMENT TO NORM GROUP ACHIEVEMENT

Washington Grade Equivalents vs. Expected Grade Equivalents. Figures 7 and 8 compare the average anticipated Mathematics achievement to obtained achievement. (See Page 4 for an explanation of anticipated achievement.) With three exceptions, all of the obtained averages for both grades were significantly below anticipated achievement.

The percentages of students in the Washington sample who scored above and below anticipated achievement are compared with the "10-10 Distribution" of the norm group in Table 3. (See Page 4 for a discussion of the "10-10 Distribution.") These percentages reveal that about one-fifth as many students as expected scored significantly above expectation, while about one and a half times as many scored below.

Table 3
Grades 4 and 6 Mathematics

PERCENTAGES OF STUDENTS SCORING ABOVE AND BELOW
THEIR ANTICIPATED ACHIEVEMENT IN TOTAL MATHEMATICS

DISTRICT TYPE	GRADE 4		GRADE 6	
	% ABOVE	% BELOW	% ABOVE	% BELOW
Urban Metro	3.8	12.1	2.1	19.5
Urban Non-metro	2.2	16.7	3.5	20.8
Suburban	0.9	17.8	1.1	24.2
Rural	1.7	16.0	3.1	19.0
Private/Parochial	1.6	14.9	1.4	18.9
State	1.8	16.1	1.4	18.9
Norm Group	10.0	10.0	10.0	10.0

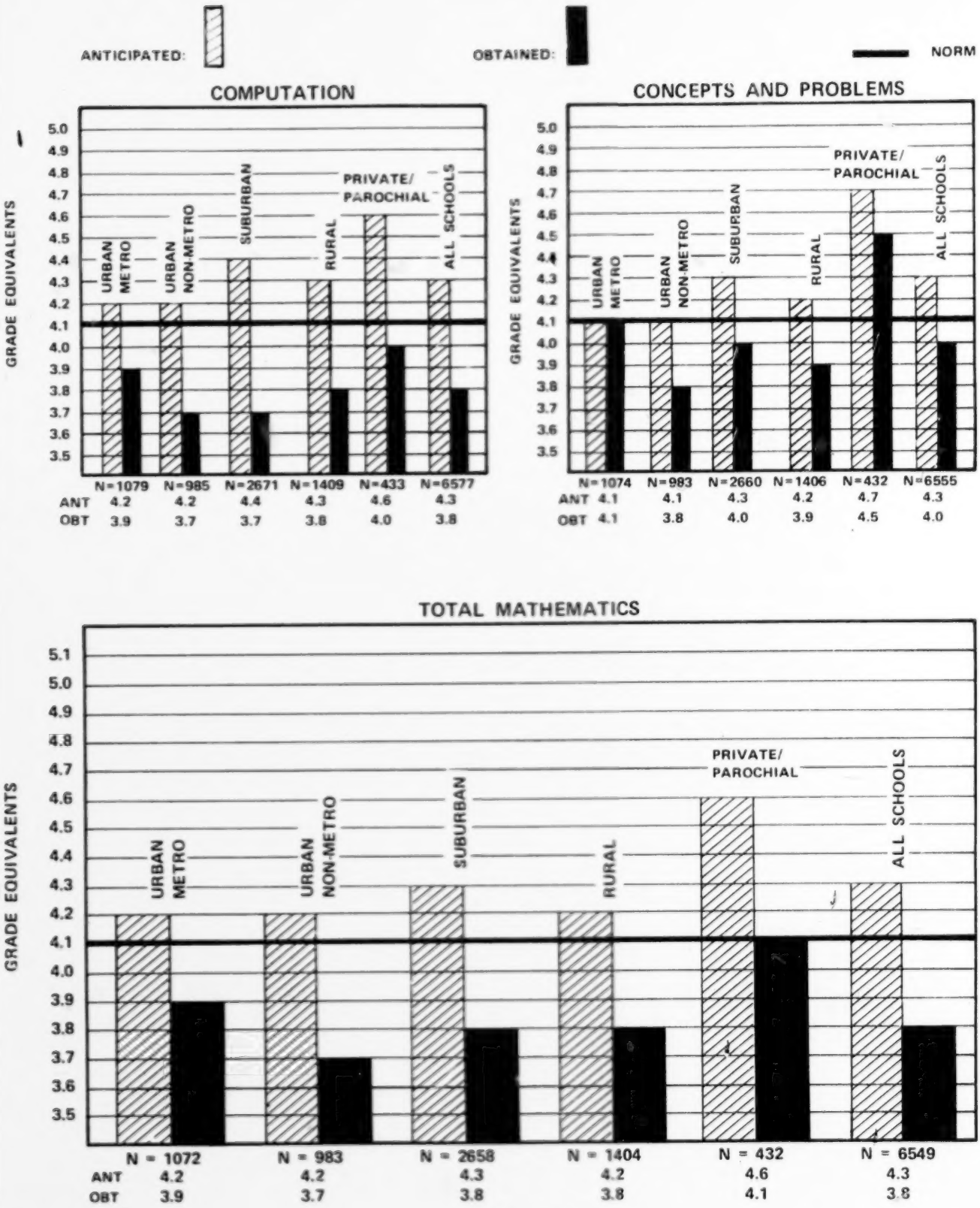
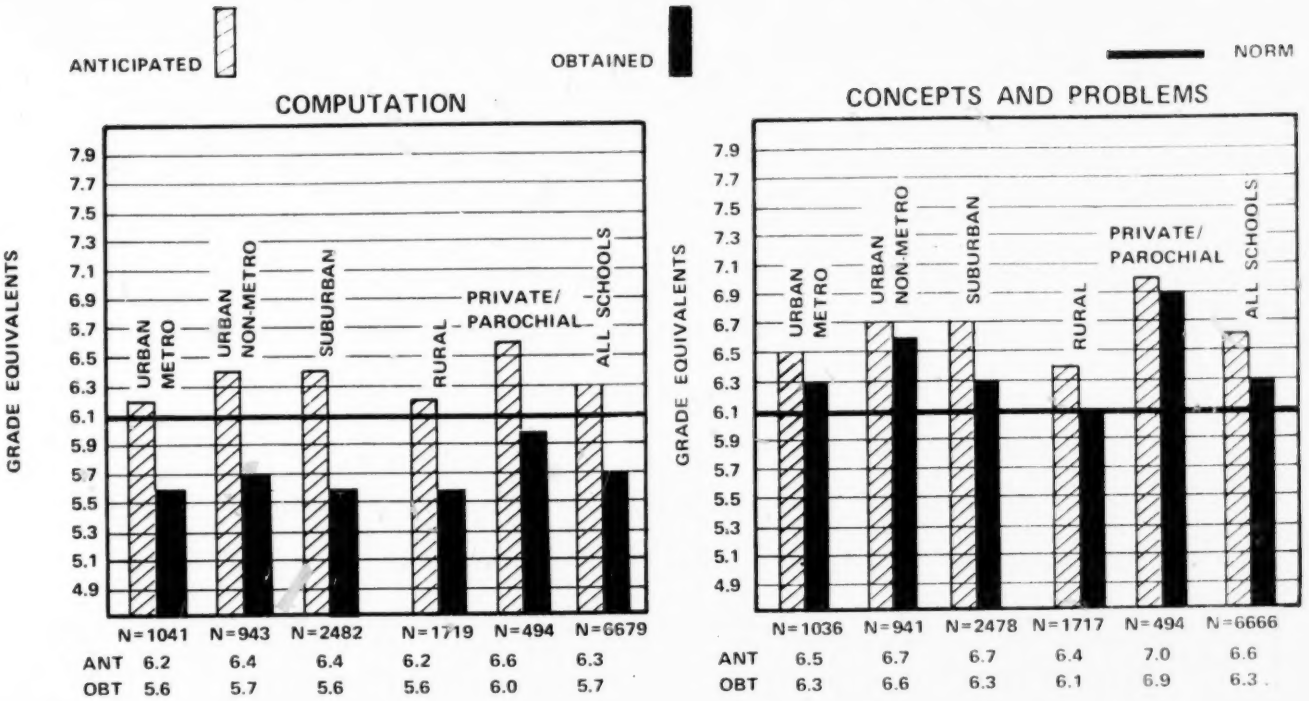


Figure 7
Grade 4 Mathematics

COMPARISON OF ANTICIPATED ACHIEVEMENT TO OBTAINED ACHIEVEMENT



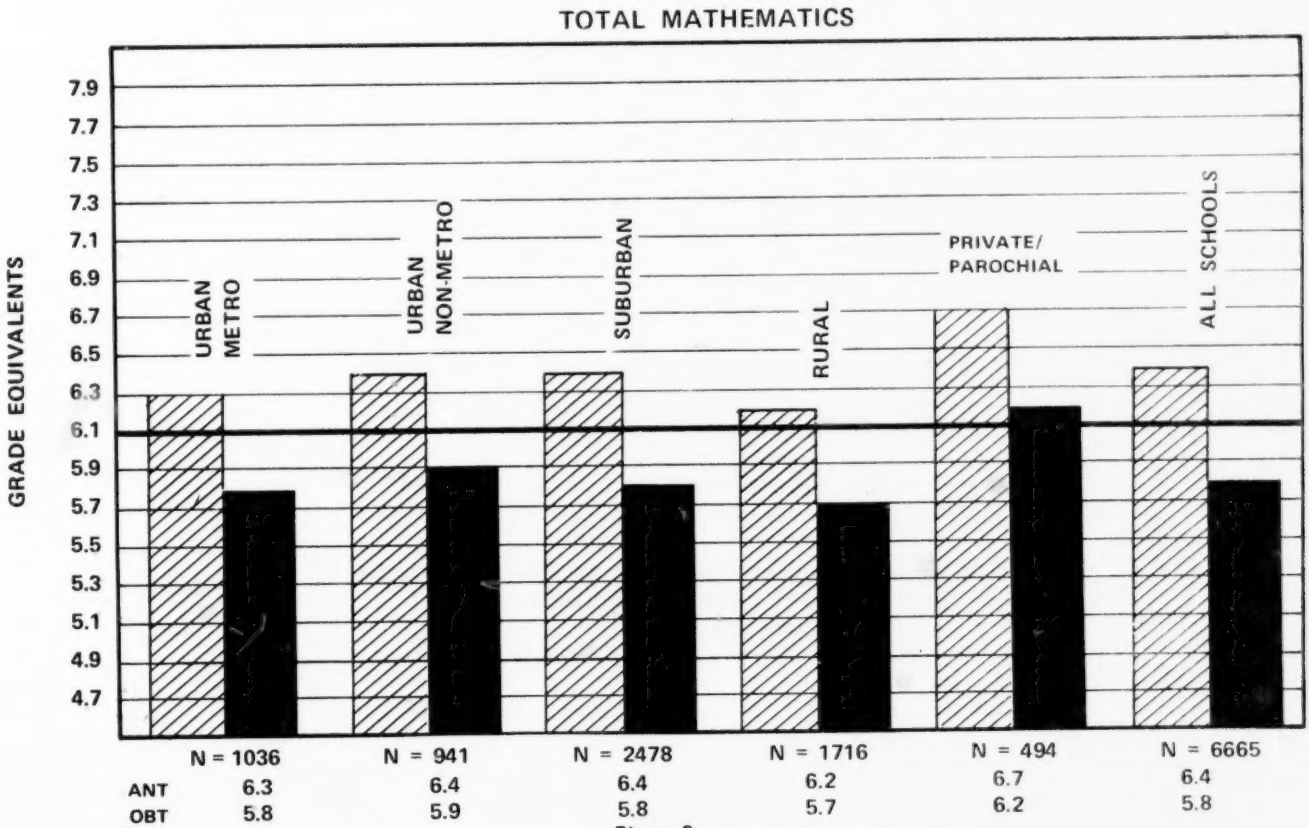


Figure 8
Grade 6 Mathematics

COMPARISON OF ANTICIPATED ACHIEVEMENT TO OBTAINED ACHIEVEMENT

SUMMARY

The achievement data from this assessment were analyzed in three ways: 1) the average achievement score of the Washington sample was compared to that of the national norm; 2) the average anticipated achievement score of the Washington sample was compared to its obtained achievement score; 3) the distribution of students scoring significantly above and below their expected level of performance was compared to the "10-10 Distribution" of the norm group. Tables 4 and 5 indicate possible strengths and weaknesses revealed in Reading and Mathematics, respectively, through each of the above comparisons. The possible strengths and weaknesses revealed in each comparison are represented in Tables 4 and 5 by the following symbols:

Comparison 1: Washington Achievement vs. Norm Achievement

+ = at least 2 months above the norm (possible strength)

0 = $\pm$ 1 month from the norm

- = at least 2 months below the norm (possible weakness)

Comparison 2: Anticipated Achievement vs. Obtained Achievement

+ = obtained achievement at least 2 months greater than anticipated achievement (possible strength)

0 = $\pm$ 1 month's difference in obtained and anticipated achievement

- = anticipated achievement at least 2 months greater than obtained achievement (possible weakness)

Comparison 3: Washington Distribution vs. "10-10 Distribution"

+ = a positive distribution based on at least 13 percent of the students scoring above their anticipated achievement and 7 percent or less of the students scoring below their anticipated achievement

0 = anticipated distribution

- = a negative distribution based on 7 percent or less of the students scoring above their anticipated achievement and at least 13 percent of the students scoring below their anticipated achievement

In all comparisons, a one month deviation above or below the norm is of no practical significance.

Table 4
Grades 4 and 6 Reading

POSSIBLE STRENGTHS AND WEAKNESSES

COMPARISON	URBAN METRO			URBAN NON-METRO			SUBURBAN			RURAL			PRIVATE/PAROCHIAL			STATE		
	*V	C	T	V	C	T	V	C	T	V	C	T	V	C	T	V	C	T
Washington Sample as Compared to National Norm																		
Grade 4	0	-	0	0	0	0	+	+	+	-	0	0	+	+	+	0	0	0
Grade 6	0	0	0	+	+	+	+	+	+	0	+	+	+	+	+	+	+	+
Anticipated Achievement as Compared to Obtained Achievement																		
Grade 4	0	-	0	0	-	0	0	-	0	-	0	0	0	0	0	0	-	0
Grade 6	-	-	-	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0
"10-10 Distribution"																		
Grade 4	0	-	0	0	-	0	0	0	0	-	0	0	0	0	0	0	-	0
Grade 6	0	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* V = Vocabulary
C = Comprehension
T = Total

Table 5
Grades 4 and 6 Mathematics

POSSIBLE STRENGTHS AND WEAKNESSES

COMPARISON	URBAN METRO	URBAN NON-METRO	SUBURBAN	RURAL	PRIVATE/PAROCHIAL	STATE
	*C CP T	C CP T	C CP T	C CP T	C CP T	C CP T
Washington Sample as Compared to National Norm						
Grade 4	- 0 -	- - -	- 0 -	- - -	0 + 0	- 0 -
Grade 6	- + -	- + -	- + -	- 0 -	0 + 0	- + -
Anticipated Achievement as Compared to Obtained Achievement						
Grade 4	- - -	- 0 -	- - -	- - -	- 0 -	- - -
Grade 6	- 0 -	- - -	- - -	- - -	- - -	- - -
"10-10 Distribution"						
Grade 4	- 0 -	- - -	- - -	- - -	- - -	- - -
Grade 6	- 0 -	- 0 -	- - -	- 0 -	- 0 -	- - -

* C = Computation
CP = Concepts and Problems
T = Total

RELATIONSHIPS BETWEEN SCHOOL CHARACTERISTICS AND ACHIEVEMENT

An analysis was made to identify relationships between characteristics of the schools and achievement test scores. School characteristics were determined from a fact sheet completed by school personnel and from information supplied by the office of the SPI. The analysis revealed little quantitative relationship at either grade between achievement and school characteristics.

Information was collected on the following characteristics:

1. District enrollment.
2. School enrollment.
3. Staff weighting factor (an index of staff qualifications based on preparation and teaching experience).
4. Per pupil expenditure.
5. Average time spent in teaching Reading to Grades 1, 2, 3, 4, 5, and 6.
6. Average time spent in teaching Mathematics to Grades 1, 2, 3, 4, 5, and 6.
7. Time spent by special reading personnel in a building.
8. Average amount of "pupil free" time given to teachers each day.
9. Basic system used to group children for reading instruction.
10. Basic system used to pace children through their reading program.
11. Basic system used to group children for mathematics instruction.
12. Basic system used to pace children through their mathematics program.
13. Teacher mobility factor (based upon the percentage of teachers leaving a building over the past three years).
14. Pupil/teacher ratio.
15. Pupil/adult ratio (includes teacher aides).

Analysis of Student Achievement on CAT-70 Reading Objectives

The items in Level 3 of the Reading Test were categorized into ten objectives (see Table 6).

In the analysis of the data, an attempt was made to determine the degree of attainment of each of the objectives by district type. The percentage of correct item response[1] was determined for the Washington Grade 4 and Grade 6 sample. The objectives were then ranked from highest percent achievement to lowest percent achievement by the total state sample.

It should be noted that the data reported in this section is simply reporting what percentage of students in each district type and total state reached a pre-determined criterion for the objective. Caution should be used in analyzing this information. A low percentage of students reaching a given objective should not be immediately construed as a negative result, as that objective may not be appropriate for that grade level. However, if the particular objective is considered valid for a given grade level and few students reach the objective, then further analysis may be indicated.

Tables 7 and 8 show the degree of attainment of each objective ranked in order from most to least in the Washington sample, Reading, Grades 4 and 6. They allow for a determination of degree of attainment of each objective by district type.

[1]Correct item response is defined as the relationship of correct answers to possible correct answers. For example, if an objective is measured by 5 items and 500 pupils respond to this objective, then there are 5 x 500 = 2,500 possible correct answers. If there were 2,000 correct answers, the percentage of correct item response is 80%. This can also be looked at as the average number of students responding correctly to items measuring the objective.

For example, Table 7 (Grade 4, Reading) shows the objective reached by the largest percentage of students in the total state sample (79%)--Objective No. 7. (The student will be able to complete a sentence about the information in a given table of contents). The objective reached by the lowest percentage of students (27%) was Objective No. 6. (The student will be able to recognize the author's purpose in writing a given passage by completing a sentence).

If these two objectives are accepted as valid objectives for the fourth grade, then greater concern for the students' performance regarding Objective No. 6 would be warranted than for Objective No. 7. However, recalling an earlier caution than the instrument used was not designed for this type of criterion-referenced analysis, another factor should be considered.

The far right-hand column shown in parenthesis lists the norm percentage of correct item response. Relative to norm performance, Washington students performed approximately the same on both Objective No. 6 and Objective No. 7. (Objective No. 6--Washington students = 27%, norm = 31%; Objective No. 7--Washington students = 79%, norm = 80%). Therefore, in a norm-referenced frame, Washington students sampled are achieving the two particular objectives at about the same level as the norm group. But from a criterion-referenced frame, the performance on the two objectives differed significantly.

Table 6

Reading Objectives, CAT-70, Level 3

1. The student will be able to choose the best meaning for a given word in a short phrase.

2. The student will demonstrate his ability to recall story facts from a passage by completing a sentence or answering a question.

3. The student will demonstrate his ability to make an inference or draw a conclusion from information given in a story or chart by completing a sentence or answering a question.

4. The student will be able to identify the cause for a given effect.

5. The student will be able to choose the main idea of paragraphs he has read by completing a sentence.

6. The student will be able to recognize the author's purpose in writing a given passage by completing a sentence.

7. The student will be able to complete a sentence about the information in a given table of contents.

8. The student will be able to complete a sentence about the information in a given index.

9. The student will demonstrate his ability to read and interpret charts and symbols by completing a sentence.

10. The student will be able to choose the main idea of a passage he has read.

Table 7

Grade 4, Reading

Percentage Correct Item Response for Each Objective

Obj. No.	Urban Metro	Urban Non-Metro	Suburban	Rural	Private/ Parochial	Total State	Norm
7	77	76	81	77	83	79	(80)
10	77	74	79	77	85	78	(83)
8	58	56	61	59	72	60	(66)
2	51	51	56	54	63	54	(59)
1	43	47	47	41	55	46	(53)
9	37	40	41	40	50	41	(49)
3	37	36	39	38	41	38	(40)
4	33	35	37	36	38	36	(37)
5	28	27	30	29	35	29	(32)
6	24	29	27	27	28	27	(31)

Table 8

Grade 6, Reading

Percentage Correct Item Response for Each Objective

Obj. No.	Urban Metro	Urban Non-Metro	Suburban	Rural	Private/ Parochial	Total State	Norm
7	91	93	93	91	95	92	(90)
10	89	90	92	90	96	89	(89)
8	77	79	80	76	88	79	(81)
2	70	73	76	73	82	74	(74)
1	67	75	74	67	80	72	(73)
9	62	67	67	65	73	66	(66)
4	52	58	60	56	66	58	(51)
3	54	57	58	56	63	57	(57)
6	39	44	44	42	49	43	(44)
5	38	41	43	40	46	41	(41)

Analysis of Student Achievement on CAT-70 Mathematics Objectives

The items in Level 3 of the Mathematics Test were categorized into twenty-six objectives (see Table 9).

In the analysis of the data, an attempt was made to determine the degree of attainment of each of the objectives by district type. The percentage of correct item response[1] was determined for the Washington Grade 4 and Grade 6 sample. The objectives were then ranked from highest percent achievement to lowest percent achievement by the total state sample.

It should be noted that the data reported in this section is simply reporting what percentage of students in each district type and total state reached a pre-determined criterion for the objective. Caution should be used in analyzing this information. A low percentage of students reaching a given objective should not be immediately construed as a negative result, as that objective may not be appropriate for that grade level. However, if the particular objective is considered valid for a given grade level and few students reach the objective, then further analysis may be indicated.

Tables 10 and 11 show the degree of attainment of each objective ranked in order from most to least in the Washington sample, Mathematics, Grade 4 and 6. They allow for a determination of degree of attainment of each objective by district type.

[1]Correct item response is defined as the relationship of correct answers to possible correct answers. For example, if an objective is measured by 5 items and 500 pupils respond to this objective, then there are 5 x 500 = 2,500 possible correct answers. If there were 2,000 correct answers, the percentage of correct item response is 80%. This can also be looked at as the average number of students responding correctly to items measuring the objective.

For example, Table 10 (Grade 4, Mathematics) shows the objective reached by the largest percentage of students on the total state sample (93%)--Objective No. 15. (The student will be able to answer a question by reading a graph or any calibrated measuring instrument). The objective reached by the lowest percentage of students (25%) was Objective No. 25. (The student will be able to multiply two numbers when at least one factor is a fraction or a mixed number).

If these two objectives are accepted as valid fourth grade objectives, then greater concern for student performance on Objective No. 25 would be warranted than for Objective No. 15. However, recalling an earlier caution, the instrument was not designed for this type of criterion-reference analysis, thus another factor should be considered.

The far right-hand column shown in parenthesis lists the norm percentage of correct item response. Relative to norm performance, Washington students performed at approximately the norm on Objective No. 15 (Washington students = 93%; norm = 91%). However, on Objective No. 25 Washington students scored at about one-half of the norm (Washington students 25%; norm 48%).

By providing the norm reference, this allows for a determination of the discrepancy between Washington student achievement and the norm group. However, the basic analysis of the objectives is the identification of the actual degree of achievement of the objectives measured by the CAT-70.

Table 9

Mathematics Objectives, CAT-70, Level 3

1. The student will be able to add numbers with as many as two digits, with or without regrouping.

2. The student will be able to subtract numbers with as many as two digits with or without regrouping.

3. The student will be able to add three or four digit numbers, with or without regrouping.

4. The student will be able to subtract three or four digit numbers with or without regrouping.

5. The student will be able to multiply numbers with as many as two digits by numbers with one digit.

6. The student will be able to divide numbers with as many as two digits by numbers with one digit.

7. The student will be able to multiply numbers with three or four digits by numbers with up to three digits.

8. The student will be able to divide numbers with three or four digits by numbers with up to three digits.

9. The student will be able to add or subtract numbers representing amounts of money or lengths of measure.

10. The student will be able to multiply or divide numbers representing amounts of money or lengths of time.

11. The student will be able to match a mathematics symbol or abbreviation to its word name.

12. The student will be able to supply a missing numeral in a simple equation.

13. The student will be able to answer a question concerning a plane geometric figure (such as, choosing the longest line segment).

14. The student will be able to match a number or an amount of money written in words to its numeric expression.

15. The student will be able to answer a question by reading a graph or any calibrated measuring instrument.

16. The student will be able to convert a specified quantity from one form to another (such as feet to inches or percent to fraction).

17. The student will be able to convert a Roman numeral to a base-ten numeral.

18. The student will be able to answer a question showing his understanding of place value or digit value in the base-ten number system.

19. The student will be able to solve a one-step word problem using addition, subtraction, multiplication and/or division.

20. The student will be able to solve a two-step word problem using addition, subtraction, multiplication and/or division.

21. The student will be able to solve a word problem involving the addition and/or subtraction of amounts of money.

22. The student will be able to solve a word problem in which he finds the average of two or more numbers.

23. The student will be able to add two numbers when at least one addend is a fraction or a mixed number.

24. The student will be able to subtract two numbers when at least one term is a fraction or a mixed number.

25. The student will be able to multiply two numbers when at least one factor is a fraction or a mixed number.

26. The student will be able to divide two numbers when at least one term is a fraction or a mixed number.

Table 10

Grade 4, Mathematics

Percentage Correct Item Response for Each Objective

Obj. No.	Urban Metro	Urban Non-Metro	Suburban	Rural	Private/ Parochial	Total State	Norm
15	92	92	93	92	96	93	(91)
1	91	92	92	92	93	92	(93)
11	89	89	89	87	91	89	(89)
3	86	85	87	86	90	87	(89)
2	85	86	87	86	90	86	(90)
6	86	86	87	85	92	86	(93)
12	81	84	84	83	88	83	(83)
4	79	81	82	82	87	82	(86)
5	80	81	82	82	88	82	(86)
17	73	72	71	78	83	74	(78)
18	72	77	74	72	77	74	(73)
20	72	77	74	72	79	74	(73)
14	73	73	71	70	78	72	(71)
19	--	74	72	70	76	72	(71)
21	68	70	69	68	73	69	(68)
7	86	76	67	65	75	67	(73)
9	87	66	67	68	70	67	(74)
10	65	63	62	63	71	63	(73)
24	48	53	52	52	53	52	(68)
8	50	51	51	50	63	51	(64)
13	49	46	47	44	53	47	(49)
23	51	46	46	47	49	47	(64)
22	44	41	35	34	41	37	(49)
16	36	34	34	32	41	34	(42)
26	26	29	26	26	28	27	(42)
25	25	28	23	25	25	25	(48)

Table 11

Grade 6, Mathematics

Percentage Correct Item Response for Each Objective

Obj. No.	Urban Metro	Urban Non-Metro	Suburban	Rural	Private/ Parochial	Total State	Norm
1	82	83	83	84	88	83	(87)
15	77	75	78	77	83	78	(80)
3	75	72	74	74	76	74	(80)
2	72	68	68	70	73	69	(79)
4	68	65	66	68	72	67	(76)
11	67	59	63	61	70	63	(77)
12	59	60	64	61	74	63	(73)
19	52	51	53	52	58	53	(58)
20	52	50	53	49	56	52	(54)
17	51	45	48	53	59	50	(56)
18	46	48	49	48	51	48	(55)
14	50	46	48	47	58	48	(58)
21	45	45	46	46	49	45	(49)
6	43	39	43	44	57	44	(72)
9	47	41	42	44	49	44	(54)
5	42	38	40	41	46	41	(71)
24	36	34	35	37	35	36	(39)
23	31	29	31	32	30	31	(33)
7	27	25	27	27	40	27	(47)
13	24	21	23	23	26	23	(30)
10	20	17	18	19	20	18	(42)
26	17	17	16	21	18	17	(21)
25	14	13	13	13	14	14	(14)
8	13	12	13	12	14	13	(27)
16	13	11	11	11	12	12	(19)
22	13	13	12	9	11	12	(15)

CONCLUSIONS

Six main conclusions can be drawn from the results of this assessment:

1. The Washington students generally performed comparable to or above the national norm in Reading and below the national norm in Mathematics in both grades.

2. The Washington fourth and sixth graders generally scored as anticipated in Reading and significantly below what was expected of them in Mathematics.

3. In Mathematics, the averages in the Concepts and Problems subtest were generally higher than those of the Computation subtest. This was more pronounced in Grade 6 than in Grade 4.

4. The proportions of students who scored significantly above and below their anticipated achievement was generally less favorable than the norm in mathematics.

5. Comparing the five district types to one another, the private/parochial schools ranked first in both grades in Reading and Mathematics (see Page 1 for a possible explanation of this situation) and Suburban schools ranked second in Reading in Grades 4 and 6. Beyond that point the performance of the remaining districts was comparable.

6. Little relationship existed between school characteristics and achievement.

NEXT STEPS FOR A SCHOOL DISTRICT

GIVEN:
(Mathematics)

The data indicates that students may be weak in computational skills.

QUESTIONS:

1. Do you have current data with respect to mathematics achievement on your student population?

   a. Do your students follow the trend in computational skills?

   b. Do your students follow the trend in concepts and problem solving?

   c. Are the objectives (listed on pages 30-31 and analyzed on pages 32-33), appropriate to grades 4 and 6 in your school district?

   d. Do you know how well your students are performing on those objectives which you consider appropriate?

GIVEN:
(Reading)

The data indicates that more students scored below their anticipated level in Reading than was expected.

QUESTIONS:

1. Do you have current data with respect to reading achievement on your student population?

   a. Do your students follow the trend in vocabulary?

   b. Do your students follow the trend in comprehension?

   c. Are the objectives (listed on page 25 and analyzed on pages 26-27) appropriate to grades 4 and 6 in your school district?

   d. Do you know how well your students are performing on those objectives which you consider appropriate?

ACTION: Several steps should be considered before you move in an effort to increase the effectiveness of your program.

1. If you do not have current data, you should collect it.

2. If you discover areas of weakness, you should investigate alternatives aimed at strengthening those weaknesses.

3. In your attempt to strengthen areas of weakness, you should be particularly cautious that in so doing you are <u>not</u> jeopardizing another area.

4. In your investigation of alternatives you might want to consider one or more of the following:

   increased emphasis
   increased time allocation
   new or different materials
   increased use of games
   more manipulatives
   alternative teaching strategies
   cross age tutoring
   inservice for teachers